

## WHAT IS CLAIMED IS:

1. A method for producing transgenic plants capable of the regulated expression of a cytokinin-modulating gene in developing seed or related female reproductive tissue comprising:
  - 5 transformation of plant host cells with a genetic construct capable of temporally- or spatially-regulated expression of a cytokinin modulating gene in developing seed or related female reproductive tissue; and
  - 10 regenerating and recovering said transgenic plants.
2. The method according to Claim 1 wherein the transformation is carried out by a process selected from the group consisting of electroporation, PEG poration, particle bombardment, silicon fiber delivery, microinjection, and Agrobacterium-mediated transformation.
- 15 3. The method according to Claim 2 wherein said process of transformation is particle bombardment.
4. The method according to Claim 2 wherein said process of transformation is Agrobacterium-mediated transformation.
5. The method according to Claim 1 wherein said genetic construct comprises a promoter directing temporal or spatial gene expression in developing seed or related female reproductive tissue, operably linked to a cytokinin-modulating gene.
  - 20 6. The method according to Claim 5 wherein said promoter is selected from the group consisting of zag2.1, zap, tb1, eep1, eep2, F3.7, thxH, Zm40, ESR, PCNA2, lec1, ZmCkx1-2, ZmCkx2, ZmCkx3, ZmCkx4, and ZmCkx5.
  - 25 7. The method according to Claim 1 wherein the cytokinin modulating gene is selected from the group consisting of genes encoding cytokinin biosynthetic enzymes, cytokinin catabolic enzymes, cytokinin catabolic enzyme antagonists and cytokinin biosynthetic enzyme agonists.
  - 30 8. A transgenic plant comprising a genetic construct stably integrated into the genome thereof, said construct comprising a promoter operably linked to a

cytokinin-modulating gene, wherein said promoter directs temporal or spatial expression in developing seed or related female reproductive tissues of said plant.

9. The plant according to Claim 8 wherein said promoter is selected from the group consisting of zag2.1, zap, tb1, eep1, eep2, F3.7, thxH, Zm40, ESR, PCNA2, lec1, ZmCkx1-2, ZmCkx2, ZmCkx3, ZmCkx4, and ZmCkx5.
10. The plant according to Claim 9 wherein the cytokinin modulating gene is selected from the group consisting of genes encoding cytokinin biosynthetic enzymes, cytokinin catabolic enzymes, cytokinin catabolic enzyme antagonists and cytokinin biosynthetic enzyme agonists.
11. An isolated recombinant DNA comprising a genetic construct comprising a promoter directing temporal or spatial gene expression in developing plant seed or related female reproductive tissue operably linked to a cytokinin modulating gene.
12. Host cells having stably introduced therein the genetic construct of Claim 11.
13. A method for improving stress tolerance and yield stability in plants comprising:
  - transformation of plant host cells with a genetic construct driving preferential expression of cytokinin-modulating genes in developing seed and related female reproductive tissue;
  - and regenerating and recovering transformed plants from said cells.
14. The method according to Claim 13 wherein said preferential expression occurs from about 14 days prior to about 25 days after pollination.
15. The method according to Claim 13 wherein said preferential expression occurs from about 0 to about 6 days after pollination.
16. The method according to Claim 13 wherein said preferential expression occurs from about 0 to about 12 days after pollination.
17. The method according to Claim 13 wherein said preferential expression occurs from about 4 to about 21 days after pollination.

18. A transgenic plant comprising a recombinant expression cassette stably integrated into the genome thereof, said cassette capable of effecting an increase in cytokinin activity, wherein said transgenic plant displays enhanced vigor without significant detrimental effects of increased cytokinin activity.
19. Seeds of the transgenic plant of Claim 18.
20. The transgenic plant of Claim 18, wherein said enhanced vigor is expressed in the presence or absence of abiotic stress.
21. A method of developing a maize plant utilizing the plant of Claim 18 as a source of genetic material in a breeding program.
22. The method of Claim 21 further comprising one or more techniques selected from the group consisting of: recurrent selection, mass selection, bulk selection, backcross, pedigree, development of a synthetic, and open pollination.
23. The transgenic plant of Claim 18, wherein said recombinant expression cassette comprises a polynucleotide encoding a protein involved in cytokinin biosynthesis.
24. The transgenic plant of Claim 18, wherein said recombinant expression cassette comprises a polynucleotide encoding isopentenyl transferase.
25. The transgenic plant of Claim 23, wherein said recombinant expression cassette comprises the zag2.1 promoter operably linked to a polynucleotide encoding a protein involved in cytokinin biosynthesis.
26. The transgenic plant of Claim 23, wherein said recombinant expression cassette comprises the eep1 promoter operably linked to a polynucleotide encoding a protein involved in cytokinin biosynthesis.
27. The transgenic plant of Claim 23, wherein said recombinant expression cassette comprises the eep2 promoter operably linked to a polynucleotide encoding a protein involved in cytokinin biosynthesis.
28. The transgenic plant of Claim 23, wherein said recombinant expression cassette comprises the zap promoter operably linked to a polynucleotide encoding a protein involved in cytokinin biosynthesis.

29. The transgenic plant of Claim 23, wherein said recombinant expression cassette comprises the *tb1* promoter operably linked to a polynucleotide encoding a protein involved in cytokinin biosynthesis.
- 5 30. The transgenic plant of Claim 23, wherein said recombinant expression cassette comprises the *ckx1-2* promoter operably linked to a polynucleotide encoding a protein involved in cytokinin biosynthesis.
- 10 31. The transgenic plant of Claim 23, wherein said recombinant expression cassette comprises a promoter which drives low-level constitutive expression of an operably-linked polynucleotide encoding a protein involved in cytokinin biosynthesis.
32. The transgenic plant of Claim 23, wherein said recombinant expression cassette comprises the F3.7 promoter.
- 15 33. The transgenic plant of Claim 23, wherein said recombinant expression cassette comprises (1) a reproductive-tissue-preferred promoter operably linked to a polynucleotide encoding a protein involved in cytokinin biosynthesis and (2) one or more promoters or enhancer elements of a highly-expressed gene.
34. The transgenic plant of Claim 33 wherein the enhancer element comprises the 35S enhancer of cauliflower mosaic virus.
- 20 35. The transgenic plant of Claim 34 wherein the 35S enhancer comprises SEQ ID NO: 4.
- 25 36. The transgenic plant of Claim 33 wherein the recombinant expression cassette comprises (1) the *zag2.1* promoter operably linked to a polynucleotide encoding *ipt* and (2) the cauliflower mosaic virus 35S enhancer.
37. The transgenic plant of Claim 36 wherein the recombinant expression cassette comprises (1) SEQ ID NO: 3 operably linked to the coding region of SEQ ID NO: 1 and (2) SEQ ID NO: 4.
- 30 38. The transgenic plant of Claim 18, wherein said recombinant expression cassette comprises a first polynucleotide involved in silencing of a gene encoding a protein involved in decreasing the active cytokinin pool.

39. The transgenic plant of Claim 38, wherein said protein involved in decreasing the active cytokinin pool is cytokinin oxidase.
40. The transgenic plant of Claim 38, further comprising a promoter preferentially driving expression in developing seed or related female reproductive tissues, operably linked to a second polynucleotide encoding a protein involved in cytokinin biosynthesis.
41. The transgenic plant of Claim 38, wherein said first polynucleotide comprises an antisense sequence for a polynucleotide encoding a protein involved in decreasing the active cytokinin pool.
42. The transgenic plant of Claim 38, wherein said first polynucleotide comprises a sequence effective in cosuppression of a polynucleotide encoding a protein involved in decreasing the active cytokinin pool.
43. The transgenic plant of Claim 38, wherein said first polynucleotide comprises a sequence effective in RNAi of a polynucleotide encoding a protein involved in decreasing the active cytokinin pool.
44. A method of modulating cytokinin activity in a plant, wherein modulated cytokinin activity enhances plant vigor without significant detrimental effects, comprising stably transforming said plant to result in an increase in cytokinin activity.
45. The method of Claim 44 wherein said plant is stably transformed with a recombinant expression cassette capable of effecting an increase in cytokinin activity, wherein said transgenic plant displays enhanced vigor without significant detrimental effects of increased cytokinin activity.
46. The method of Claim 45, wherein said enhanced vigor is expressed in the presence or absence of abiotic stress.
47. The method of Claim 45, wherein said recombinant expression cassette comprises a polynucleotide encoding a protein involved in cytokinin biosynthesis.
48. The method of Claim 45, wherein said recombinant expression cassette comprises a polynucleotide encoding isopentenyl transferase.

49. The method of Claim 45, wherein said recombinant expression cassette comprises a promoter selected from the group consisting of zag2.1, zap, tb1, eep1, eep2, F3.7, thxH, Zm40, ESR, PCNA2, lec1, ZmCkx1-2, ZmCkx2, ZmCkx3, ZmCkx4, and ZmCkx5.
- 5 50. The method of Claim 45, wherein said recombinant expression cassette comprises (1) a female reproductive-tissue-preferred promoter operably linked to a polynucleotide encoding a protein involved in cytokinin biosynthesis and (2) one or more promoters or enhancer elements of a highly-expressed gene.
- 10 51. The method of Claim 50 wherein the enhancer element comprises the 35S enhancer of cauliflower mosaic virus.
52. The method of Claim 51 wherein the 35S enhancer comprises SEQ ID NO: 4.
53. The method of Claim 50 wherein the recombinant expression cassette  
15 comprises (1) the zag2.1 promoter operably linked to a polynucleotide encoding *ipt* and (2) the cauliflower mosaic virus 35S enhancer.
54. The method of Claim 53 wherein the recombinant expression cassette comprises (1) SEQ ID NO: 3 operably linked to the coding region of SEQ ID NO: 1 and (2) SEQ ID NO: 4.
- 20 55. The method of Claim 45, wherein said recombinant expression cassette comprises a first polynucleotide involved in silencing of a gene encoding a protein involved in decreasing the active cytokinin pool.
56. The method of Claim 55, wherein said protein involved in decreasing the active cytokinin pool is cytokinin oxidase.
- 25 57. The method of Claim 55, wherein said plant is further stably transformed with a promoter preferentially driving expression in developing seed or related female reproductive tissues, operably linked to a second polynucleotide encoding a protein involved in cytokinin biosynthesis.
58. The method of Claim 55, wherein said first polynucleotide comprises an  
30 antisense sequence for a polynucleotide encoding a protein involved in decreasing the active cytokinin pool.

59. The method of Claim 55, wherein said first polynucleotide comprises a sequence effective in cosuppression of a polynucleotide encoding a protein involved in decreasing the active cytokinin pool.
60. The method of Claim 55, wherein said first polynucleotide comprises a sequence effective in RNAi of a polynucleotide encoding a protein involved in decreasing the active cytokinin pool.
61. An isolated promoter capable of driving transcription in a seed-preferred manner, wherein the promoter comprises a nucleotide sequence selected from the group consisting of:
- a sequence comprising a fragment of the nucleotide sequence set forth in SEQ ID NO: 7 or 18; and
  - the nucleotide sequence set forth in SEQ ID NO: 7 or 18.
62. The isolated promoter of Claim 61 capable of driving transcription in a seed-preferred manner, wherein said promoter comprises a fragment of the nucleotide sequence set forth in SEQ ID NO: 7 or 18.
63. The isolated promoter of Claim 61 capable of driving transcription in a seed-preferred manner, wherein said promoter comprises the nucleotide sequence set forth in SEQ ID NO: 7 or 18.
64. A recombinant expression cassette comprising a promoter and a nucleotide sequence operably linked to the promoter, wherein the promoter comprises a nucleotide sequence selected from the group consisting of:
- a sequence comprising a fragment of the nucleotide sequence set forth in SEQ ID NO: 7 or 18; and
  - the nucleotide sequence set forth in SEQ ID NO: 7 or 18.
65. A plant stably transformed with an expression cassette comprising a maize promoter and a nucleotide sequence operably linked to the promoter, wherein said promoter comprises a nucleotide sequence selected from the group consisting of:

a sequence comprising a fragment of the nucleotide sequence set forth in SEQ ID NO: 7 or 18; and  
the nucleotide sequence set forth in SEQ ID NO: 7 or 18.